THE NATIONAL SCIENCE MUSEUM.

IT is now fifteen years since the Duke of Devonshire's Commission, in its fourth Report, made the following recommendations :—

> "With regard to *the Scientific Collections of the South Kensington Museum*, we recommend :
>
> "9. The formation of a collection of physical and mechanical instruments; and we submit for consideration whether it may not be expedient that this collection, the collection of the Patent Museum, and that of the Scientific and Educational Department of the South Kensington Museum, should be united and placed under the authority of a Minister of State.
>
> "With regard to *Provincial Museums*, we recommend :
>
> "10. That, in connection with the Science and Art section of the Education Department, qualified naturalists be appointed to direct the collection of specimens in order to supply whatever deficiencies exist in the more important Provincial Museums ; and also in order to organize typical museums, to be sent by the Department of Science and Art into the provinces to such science schools as may be reported to be likely to make them efficient instruments of scientific instruction.
>
> "11. That a system of inspection of Provincial Museums be organized with a view of reporting on their condition, and on the extent to which they are usefully employed, and whether the conditions of the loan or grant from the Department of Science and Art have been fulfilled."

It is quite in accordance with the general way in which scientific matters are treated by the British Government that practically nothing has been done to give effect to these recommendations. Committee after Committee has been appointed, but it would seem more to give an excuse for delay than anything else. But the apathy of the Government was not shared by H.M. Commissioners for the Exhibition of 1851, for some time afterwards they offered a large site on their estate, and a building to be erected at a cost of £100,000, if the Government would undertake its maintenance for the purposes named in the recommendations. Even this munificent offer was declined.

Again we hear that another Committee has been appointed. Its sailing orders are not known, but whatever they may be, it seems desirable to again place on record after an interval of fifteen years that part of the Report in question which relates to the inquiry intrusted to the Committee. The Report was the result of much and patient inquiry and deliberation (the Commission worked for five years), and that the competence of the Commission may not be doubted after this lapse of time, we give the names of the Royal Commissioners : the Duke of Devonshire, Sir John Lubbock, Sir James P. Kay-Shuttleworth, Dr. W. Sharpey, Prof. T. H. Huxley, Prof. G. G. Stokes, Prof. Henry J. S. Smith, and Mr., now Sir, Bernhard Samuelson. Mr. J. Norman Lockyer was the secretary of the Commission.

THE COLLECTIONS AT SOUTH KENSINGTON.

64. The South Kensington Museum is administered by a Director who is responsible to the Lords of the Committee of Privy Council on Education.

65. Though, from special circumstances, the art collections of this Museum have been, up to the present time, most developed, it has contained, from its earliest days, several collections of a scientific nature. Those at present existing are :—

(1) The food collection.
(2) The animal products collection.
(3) The structure and building materials collection.
(4) Models of machinery, ships, and military and naval appliances.
(5) Collections illustrating economic entomology and forestry.
(6) Collections illustrating fish culture.
(7) The educational collections.
(8) The Patent Museum.

66. *The Food Collection.*—This collection, which was commenced in 1858, has been formed with a view to showing, first, the chemical composition of the various substances used as food ; secondly, the sources from which all varieties of food are obtained ; and, thirdly, the various substances used for adulteration, and the best methods of detecting them.

A duplicate collection of the chemical analyses of food is used for circulation among country schools, and large descriptive labels are supplied to the managers of country museums who may apply for them.

67. *The Animal Products Collection.*—This collection was established by the Commissioners for the Exhibition of 1851, who observed that, whilst the public possessed, in the Museums of Kew and Jermyn Street, collections illustrative of the economic applications of mineral and vegetable substances, there was no representation of the uses of the animal kingdom. The collection consists of animal substances employed in textile manufactures and clothing ; substances used for domestic and ornamental purposes ; pigments and dyes yielded by animals ; animal substances used in pharmacy and in perfumery ; and the application of waste matters, together with illustrations of the processes of manufacture.

We have been informed that, for want of space, this collection has been but little developed of late years.

68. *Construction and Building Materials Collection.*—This collection had its origin in a large number of models and specimens which were presented to the Commissioners for the Exhibition of 1851 at its close. In 1859 the collection had become so extensive from gifts, especially from the Exhibitions in London and Paris, that the classified Catalogue formed a most useful book of reference on the subject, and was largely sold as such.

The collection consists of the following objects :—building stones ; marbles and slates ; cements and plasters ; bricks of every description ; tiles for roofing, flooring, and wall decoration ; terra-cottas ; drain-pipes ; asphalte and bitumen ; iron and metal work ; woods applicable to building purposes ; glass, and its application ; models of buildings and construction ; paper-hangings ; *papier-mâché* work ; architectural drawings and plans.

69. In connection with this Museum, numerous experiments on the strength of materials have been carried on, the results of which have been published in the Catalogues.

70. *Models of Machinery, Ships, and Military and Naval Appliances.*—This collection consists principally of models of marine engines, ships, and guns. But there are also specimens and models of machinery of a different character, such as the Jacquard loom, the Whitworth measuring machine, and the Babbage calculating machine.

71. *Collections illustrating Economic Entomology and Forestry.*—A collection of economic entomology is now in course of formation. It is intended to enable the public to distinguish insects injurious to man from those that work to his advantage, and to illustrate the best means of destroying those which are injurious, or of mitigating the ravages committed by them.

This collection, in its relation to forestry, contains specimens of the various kinds of timber attacked by insects, the insects themselves in various stages of growth, and the appearance of the foliage and bark when attacked. The best known means of destroying the insects are also indicated.

72. *Collection illustrating Fish Culture.*—This collection illustrates the artificial breeding of fish, the protection of rivers, methods of capture of fish, &c. All or nearly all the collection belongs to Mr. Buckland (Inspector of Salmon Fisheries). It is on loan to the Museum.

73. *The Educational Collections.*—These collections comprise: (1) a library of books bearing on education in which education in science is largely represented; and (2) a collection of school furniture and fittings, philosophical instruments, apparatus for scientific and other instruction, specimens and diagrams of natural history, including mineralogy and geology, and other educational appliances, such as drawing materials, &c.

74. The origin of the library and collections is due to an Educational Exhibition formed by the Society of Arts, and held in St. Martin's Hall in the summer of 1854. When this Exhibition closed, many of the contents, English and foreign, were placed by the exhibitors at the disposal of the Society, and a strong desire was expressed that it should become a permanent institution. The collection thus formed was offered to and accepted by the Government.

75. The chief manufacturers of educational appliances and publishers of school books have largely contributed, and numerous gifts have been received from foreign Governments, especially at the close of the Exhibitions of 1862 and 1871. In consequence of the great demand for educational works on scientific subjects, the vote for purchases has of late years been largely expended in strengthening the library and collections in this direction.

76. Special collections of apparatus for teaching the various branches of science have lately been formed. Duplicate sets of these are circulated in the country.

77. The total number of books and pamphlets in the library exceeds 30,000.

78. A reading-room, ill-adapted and much too small for the purpose, as it has been stated in evidence, is attached to the library. It is open during the same hours as the Museum, and is chiefly frequented by students, teachers, clergymen, school-managers, and others who wish to consult special books, or to become acquainted with the best educational works on the various subjects.

79. *The Patent Museum.*—In connection with the South Kensington Museum, but under the control of the Commissioners of Patents, there is also a Patent Museum, consisting of a collection of patented and other inventions, ill-accommodated in a building which is much too small for the proper display of the objects. The collection belongs partly to the Commissioners of Patents, partly to the Commissioners for the Exhibition of 1851, and partly to private persons: it contains many most interesting specimens, especially a series illustrating the history of the steam-engine from its earliest days.

Proposed Additions to the Scientific Collections of the South Kensington Museum.

80. We consider it our duty to point out the striking contrast afforded by the British Museum collections, dealing with biology, geology, and mineralogy; the Jermyn Street collections, dealing with geology (scientific and economic), mineralogy, mining, and metallurgy; the Kew collections, dealing with botany, on the one hand; and, on the other hand, the collections in the Scientific Department of the South Kensington Museum (including the Patent Museum), where alone has any attempt been made to collect together, in a Museum, objects illustrating the experimental sciences.

81. While it is a matter of congratulation that the British Museum contains one of the finest and largest collections in existence illustrative of biological science, it is to be regretted that there is at present no national collection of the instruments used in the investigation of mechanical, chemical, or physical laws; although such collections are of great importance to persons interested in the experimental sciences.

82. We consider that the recent progress in these sciences, and the daily increasing demand for knowledge concerning them, make it desirable that the national collections should be extended in this direction, so as to meet a great scientific requirement which cannot be provided for in any other way.

83. The defect in our collections to which we have referred is, indeed, already keenly felt by teachers of science. If a teacher of any branch of experimental science wishes to inspect any physical instrument not in his possession, as a teacher of literature would a book, or a teacher of biology would a specimen, there is no place in the country where he can do it.

84. We are assured by high authorities that, on the Continent, collections of scientific apparatus, when combined with lectures accessible to workmen, have exerted a very beneficial influence on the development of the skill of artisans employed in making such instruments.

85. Lord Salisbury, in evidence before us, has stated:—

"There is another point in which I think that the Government might give an advantage of an educational kind to scientific research. It would be desirable, if it were possible, to provide the means of giving scientific instruction to instrument makers. My impression is that their importance to the conduct of scientific research is scarcely sufficiently recognized by the public, and that it is, I will not say quite, but almost of equal importance, to have highly educated and cultivated scientific instrument makers, as to have highly educated scientific thinkers."

86. A valuable part of the instruction to which Lord Salisbury refers would be derived from the examination of collections in which the history and latest developments of each instrument could be studied with a view to its improvement or modification in any particular direction.

87. On this point we have received interesting evidence from Colonel Strange:—

"What is your opinion as to the need of a museum of scientific instruments, and apparatus, and machines, and tools used in the arts?—I think that that is a very important branch of the subject indeed. I need scarcely allude to the great importance that is attached to that on the Continent. The name of the Conservatoire des Arts et Métiers will suggest it at once, which is the very best evidence indeed that I could produce. I have often visited it with great interest and profit. Moreover, I believe there are several others in Paris, some of more recent establishment, of the same kind; I look upon that as a most necessary part of any scientific system. No scientific system can be complete without examples of the apparatus that are being used in all branches of science, both in England and abroad, and on that point I speak from experience of the great use that such a museum would be. . . . If there were a great museum, such as I suggest, containing all the new developments in instruments, and in machines and tools, to which I could resort, I should be able to introduce modifications with far greater confidence, and it would be an enormous assistance to me individually. I find very few persons who have really studied what I will venture to call the physiology of instruments and apparatus, and such persons would derive very great advantage, I think, from being able to go to an establishment where large collections of apparatus of different dates and the products of different minds were collected together in one view, some of which would contain some desideratum of which they were in search. I think, if they had such a collection to go to, it would materially aid them in the choice of the apparatus that they required, and would tend enormously to advance exact experiments. There is no doubt that some years ago there was no nation that could compete at all with England in such matters, but we have taught the rest of the world, and the pupil has now become somewhat in advance, in many directions, of his master. Also the spread of scientific education on the Continent has tended to the application of more sound principles of construction in such things than with us."

88. Although the question of the establishment of a Museum of Scientific Apparatus is more closely allied to the objects of our Commission than that of a Museum of Mechanical Inventions, we think it right to call attention to the proposals made by a Committee of the House of Commons appointed to report on the Patent Office Library and Museum.

89. That Committee gave, in the following terms, their conception of the nature of the "General Museum of Mechanical Inventions," the establishment of which they contemplated:—

"It appears to your Committee that the chief purpose of a General Museum is to illustrate and explain the commencement, progress, and present position of the most important branches of mechanical invention; to show the chief steps by which the most remarkable machines have reached their present degree of excellence; to convey interesting and useful information, and to stimulate invention."

90. With regard to the funds which would be necessary for the establishment of such a Museum on an adequate scale, the Committee, referring to a large sum which had accumulated from the fees paid by inventors (which fund, at the end of the year 1871, amounted to £923,741 8*s*. 11*d*.), stated that—

"Your Committee consider that the principal object of the fees payable under the provisions of the Patent Law Amendment Act, was to provide for the proper working of that measure, and not for the purpose of increasing the general revenue of the country. Without entering upon the question whether or not a claim exists to have the surplus exclusively devoted to the purposes of the Act of 1852, your Committee are of opinion that for the future the annual surplus revenue accruing from the operation of that Act should be so applied to the extent which may be necessary."

91. We agree with the Committee as to the general character of the objects to which the fund in question should be appropriated.

92. We consider that this fund, which is derived in great part from the applications of scientific principles to various uses in the arts and industries of the country, would be very properly spent in bettering some of the conditions on which invention and discovery depend: and we are of opinion that, among the uses to which such a fund could be most advantageously applied, the establishment of such a Museum of Scientific Apparatus as that which we contemplate would rank among the most important; and we are convinced that such a Museum would have a material influence upon the spread of scientific instruction throughout the country, and would therefore largely foster invention and discovery.

93. We accordingly recommend the formation of a collection of physical and mechanical instruments; and we submit for consideration whether it may not be expedient that this collection, the collection of the Patent Museum, and of the Scientific and Educational Department of the South Kensington Museum, should be united and placed under the authority of a Minister of State.

94. Whether this union be effected or not, we are of opinion that it is desirable that the scientific collections now placed at South Kensington should be subjected to a critical revision, with a view to restricting them to such objects as are of national interest or utility.

REPTILIAN ORDERS.

Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum (Natural History). By G. A. Boulenger. New Edition. Pp. 311, Illustrated. (London: Published by the Trustees of the Museum, 1889.)

THE handsome volume before us deals, as its name implies, with all known existing forms of the three Reptilian orders of the Chelonians, Rhynchocephalians, and Crocodilians; but since the second group is represented only by a single species, while the number of Crocodilians comprises little more than a score of forms, the great bulk of the book is devoted to the Chelonians, and it will, therefore, mainly be this group to which our remarks will apply.

Previously to the appearance of this volume, the last systematic "Catalogue of Crocodilians and Rhynchocephalians" issued by the Museum was the quarto volume by the late Dr. Gray,[1] published in 1872; the next year having seen the publication of the revised list of Chelonians by the same author.[2] Without in any way wishing to disparage the labours of the late Keeper of the Zoological Department, to whose untiring energy the British Museum is so greatly indebted for its magnificent series of Reptiles, it is at once manifest that the present work is enormously in advance of any hitherto published, this advance being especially noticeable in the case of the Chelonians. Although in that order Dr. Gray figured a large number of skulls, yet the distinctive features afforded by this part of the skeleton were not accurately gauged from a taxonomic point of view, while the characters of the bony carapace, so far as they relate to the connections of the component bones with one another, were practically ignored. In this respect Mr. Boulenger has conferred a great boon, not only on the students of the Chelonia of the present day, but still more especially on those engaged in the study of fossil forms, who generally have to deal only with the more or less imperfect carapace and plastron. In almost every genus the author has caused at least one specimen to be stripped of its epidermal horny shields, so as to exhibit not only the impressions formed by the borders of these shields, but also the form and relations of the underlying bones which constitute the solid shell. And he has found that generic characters can be to a very large extent based on the structure of the skull, taken together with the form and relations of the bones of the shell; the contour of the neural bones of the carapace, and the relations of the suture between the humeral and pectoral shields of the plastron to the entoplastral bone being of especial importance. No less than seventy-three admirably-executed woodcuts serve to illustrate these osteological features, on which the taxonomy is so largely based; and by their aid the palæontologist may hope to clear up to some extent the affinities of the host of fossil Chelonians at present described under the vague terms of *Emys* and *Clemmys*.

The author proposes to divide the Reptiles treated of

---

[1] "Catalogue of Shield-Reptilia. Part 2. Emydosaurians, Rhynchocephalia, and Amphisbænians." (1872.)

[2] "Hand-List of the Specimens of Shield-Reptiles." (1873.)